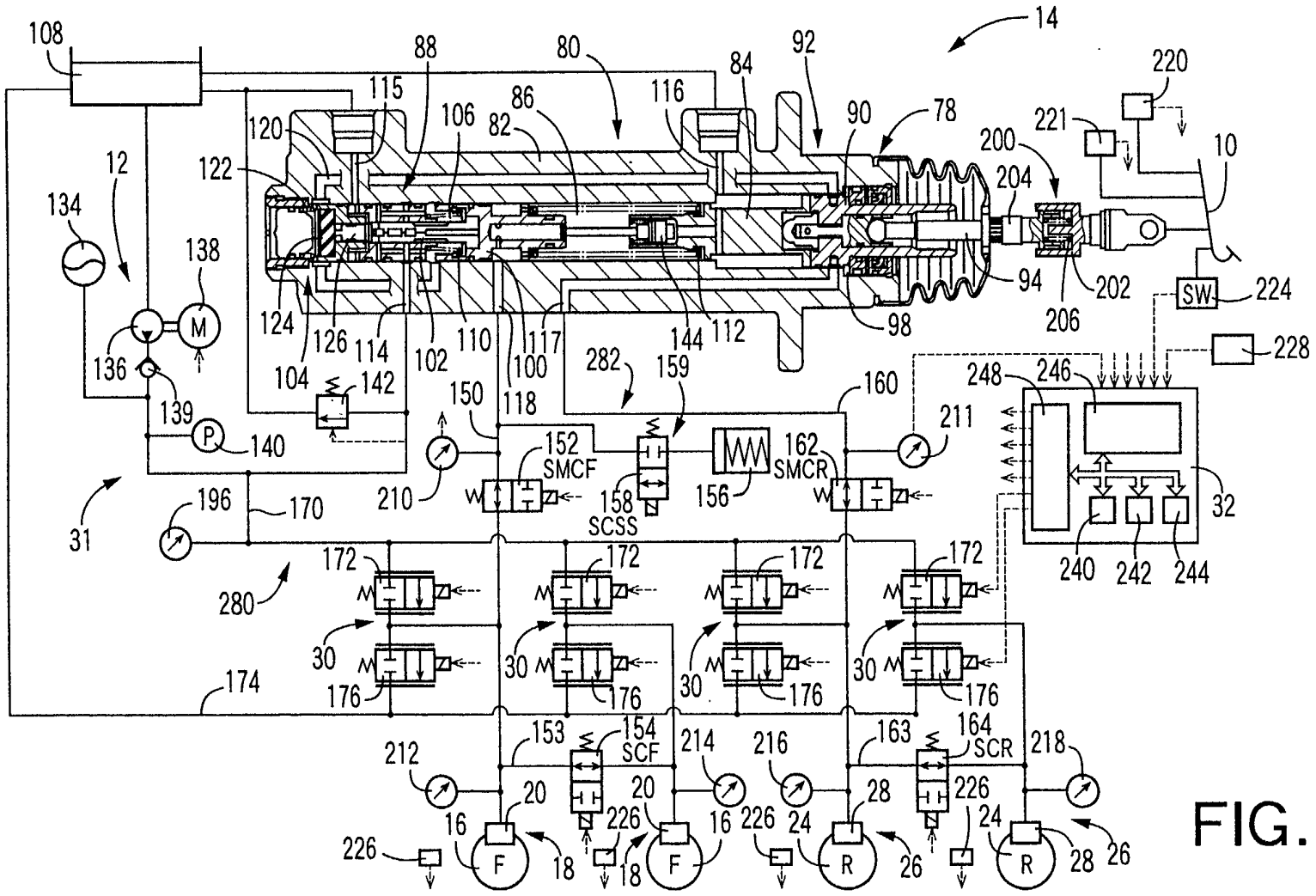

14
108
88
80
92
84
220
115
106
86
116
90
78
221
200
10
120
82
204
12
122
134
138
94
202
SW
224
206
98
228
124
126
114
102
110
117
144
112
104
142
282
159
160
248
246
136
150
118
211
139
152
SMCF
162
SMCR
P
140
210
158
156
SCSS
32
31
196
170
240
242
244
172
280
30
176
174
153
154
SCF
214
216
163
164
SCR
218
212
20
226
16
F
18
R
24
28
26

FIG. 1

FIG. 2

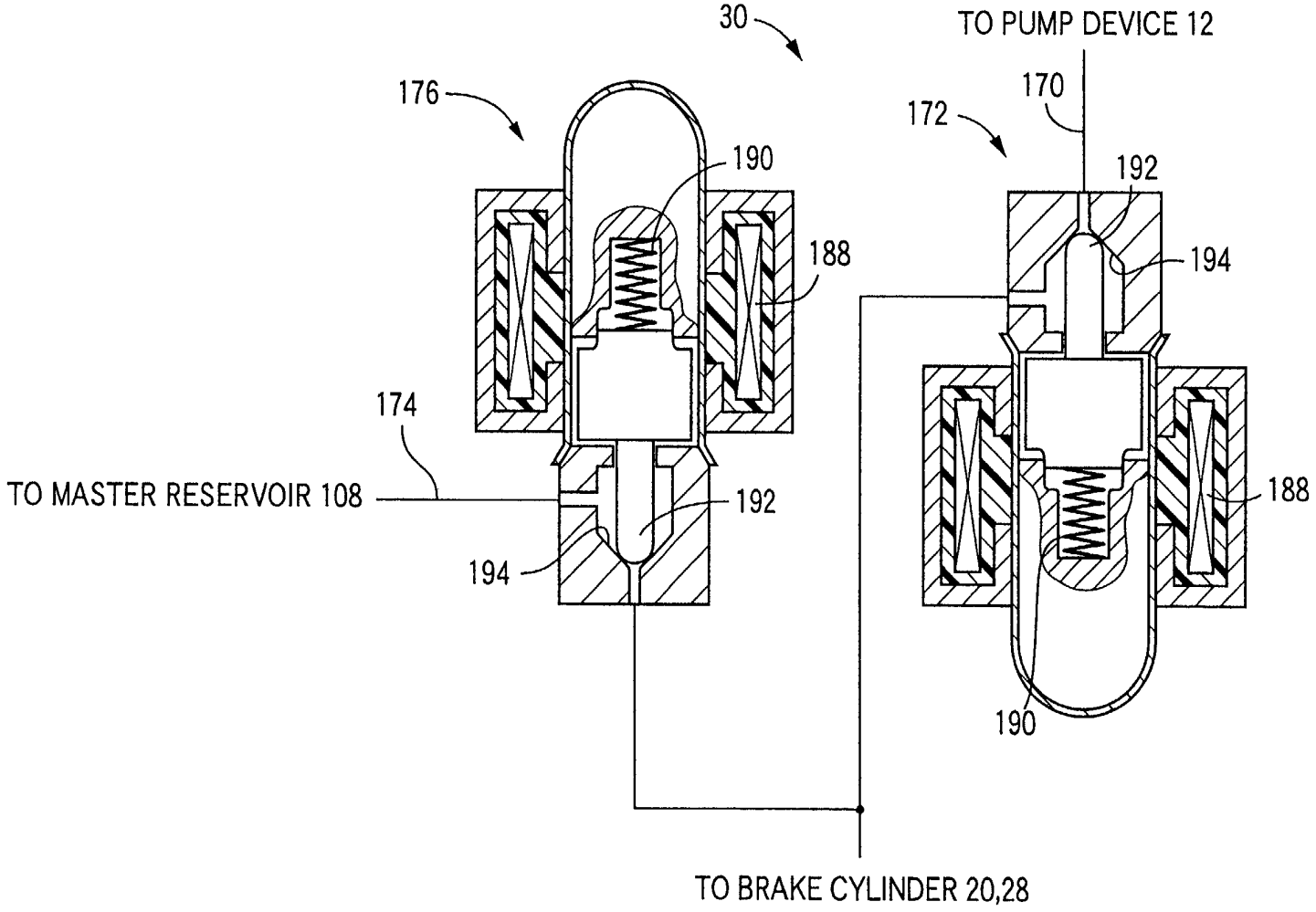

30
TO PUMP DEVICE 12
176
170
172
190
192
188
194
174
TO MASTER RESERVOIR 108
192
188
194
190
TO BRAKE CYLINDER 20,28

FIG. 3

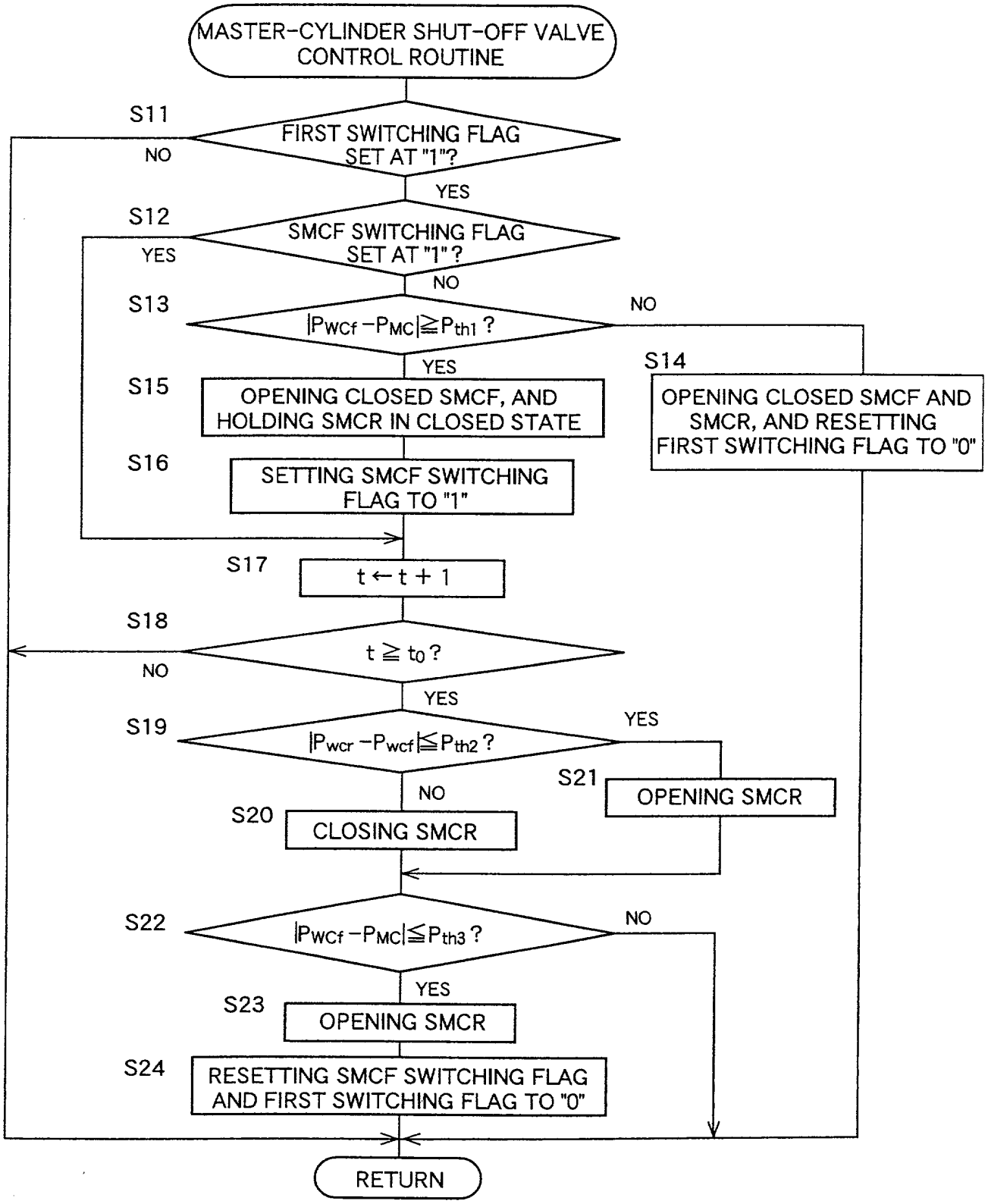

MASTER-CYLINDER SHUT-OFF VALVE CONTROL ROUTINE
S11
FIRST SWITCHING FLAG SET AT "1"?
NO
YES
S12
SMCF SWITCHING FLAG SET AT "1"?
YES
NO
S13
|PWCf −PMC|≧Pth1 ?
NO
YES
S14
OPENING CLOSED SMCF AND SMCR, AND RESETTING FIRST SWITCHING FLAG TO "0"
S15
OPENING CLOSED SMCF, AND HOLDING SMCR IN CLOSED STATE
S16
SETTING SMCF SWITCHING FLAG TO "1"
S17
t ← t + 1
S18
t ≧ t0 ?
NO
YES
S19
|Pwcr −Pwcf|≦Pth2 ?
YES
NO
S21
OPENING SMCR
S20
CLOSING SMCR
S22
|PWCf −PMC|≦Pth3 ?
NO
YES
S23
OPENING SMCR
S24
RESETTING SMCF SWITCHING FLAG AND FIRST SWITCHING FLAG TO "0"
RETURN

FIG. 4A
FRONT WHEELS

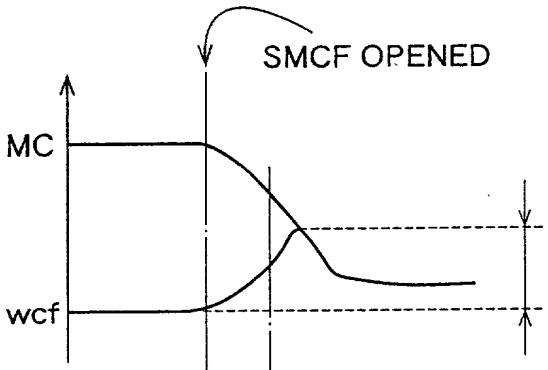


FIG. 4B
REAR WHEELS

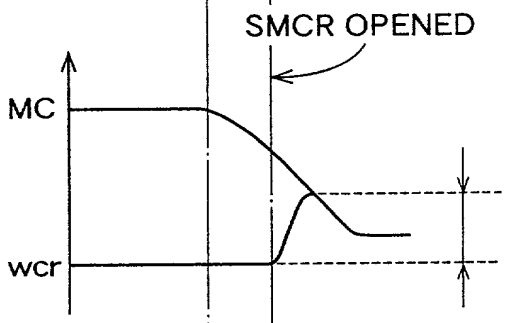


FIG. 4C
REAR WHEELS

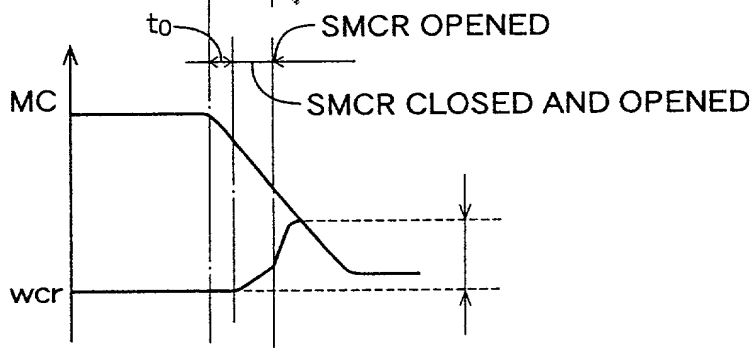


FIG. 4D
REAR WHEELS

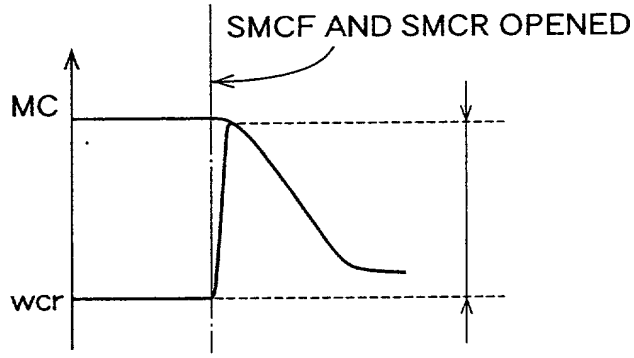


FIG. 5

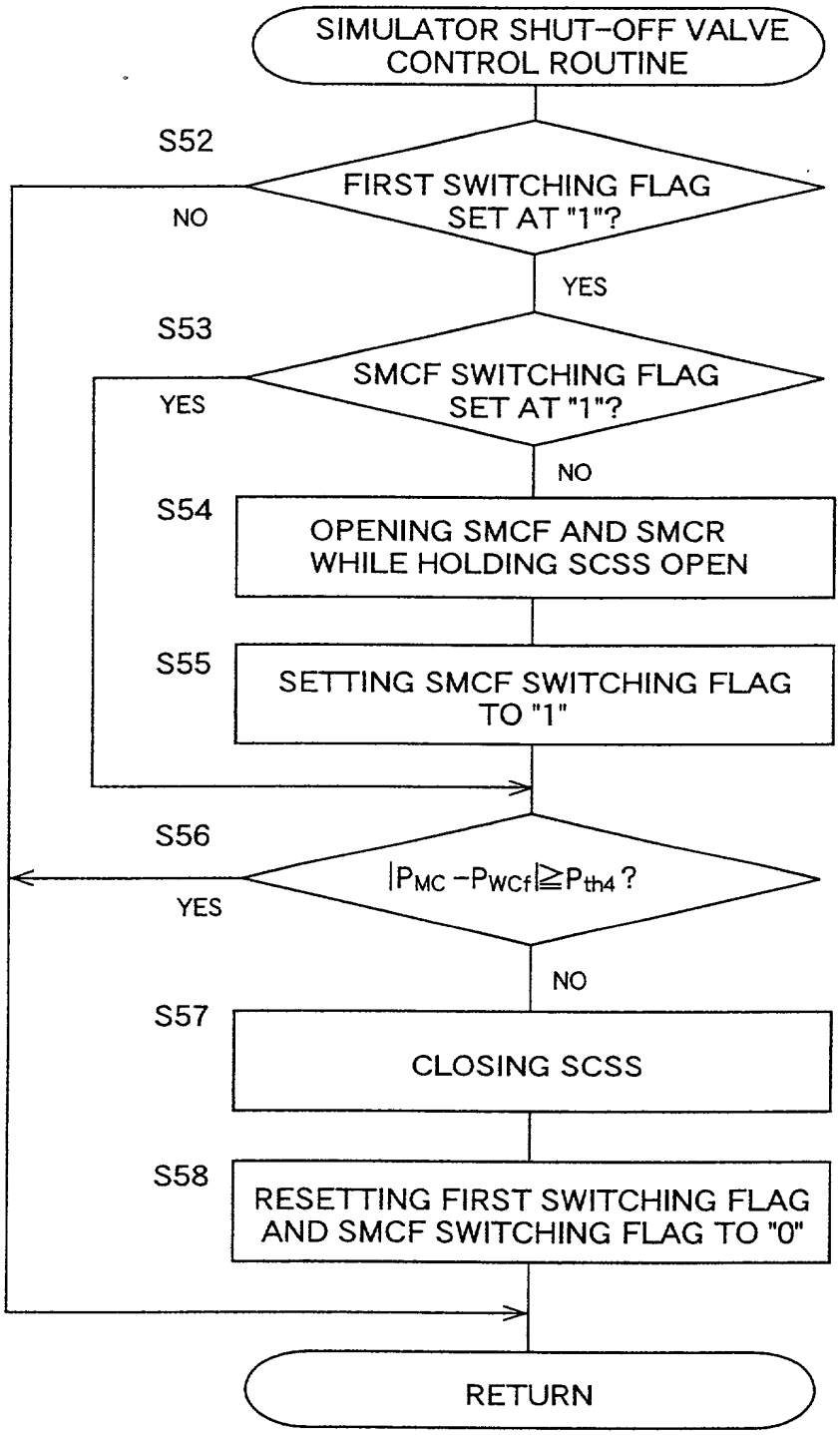

SIMULATOR SHUT-OFF VALVE CONTROL ROUTINE
S52
FIRST SWITCHING FLAG SET AT "1"?
NO
YES
S53
SMCF SWITCHING FLAG SET AT "1"?
YES
NO
S54
OPENING SMCF AND SMCR WHILE HOLDING SCSS OPEN
S55
SETTING SMCF SWITCHING FLAG TO "1"
S56
$|P_{MC} - P_{WCf}| \geqq P_{th4}$?
YES
NO
S57
CLOSING SCSS
S58
RESETTING FIRST SWITCHING FLAG AND SMCF SWITCHING FLAG TO "0"
RETURN

FIG. 6

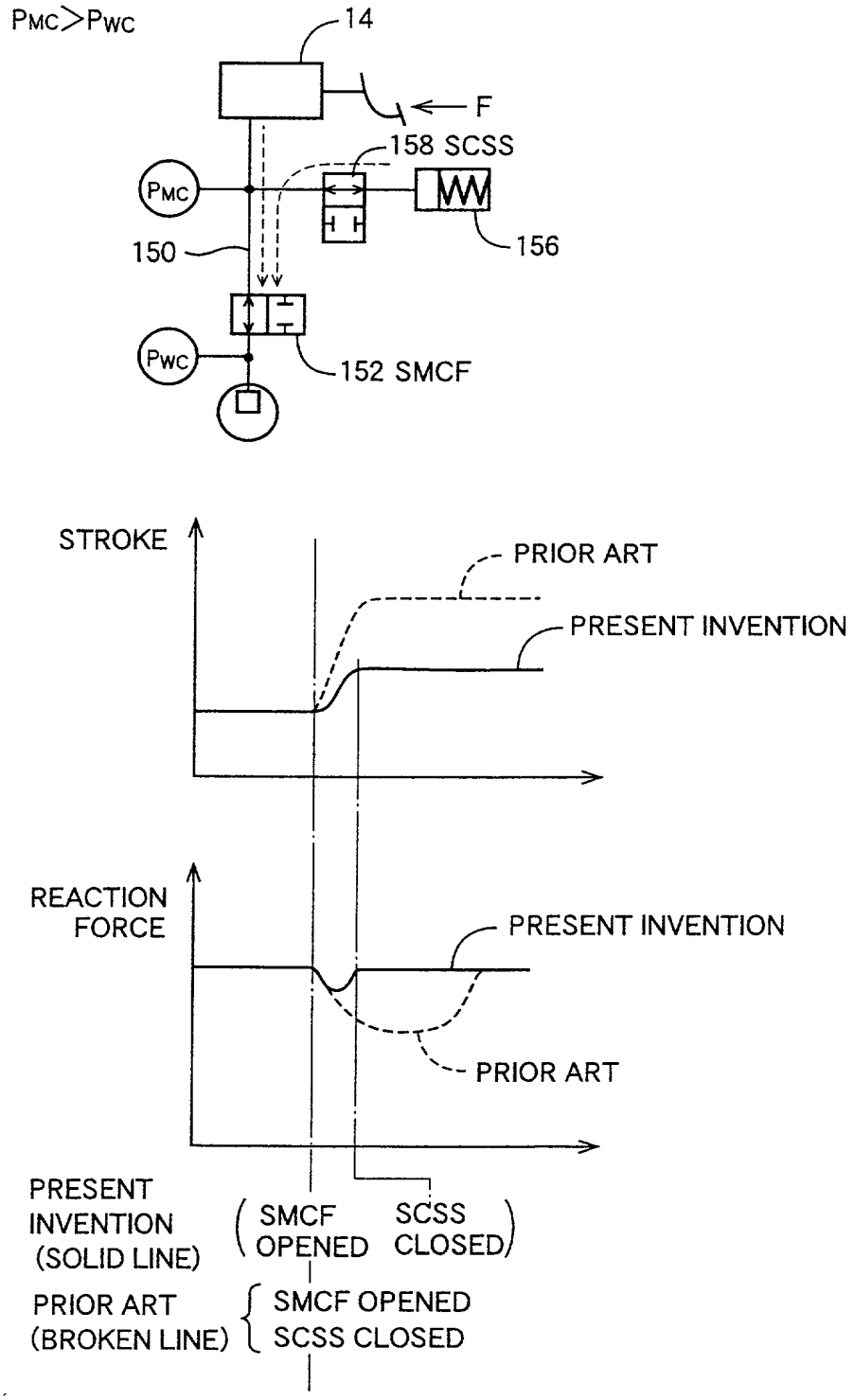

PMC>PWC
14
F
158 SCSS
PMC
150
156
PWC
152 SMCF
STROKE
PRIOR ART
PRESENT INVENTION
REACTION FORCE
PRESENT INVENTION
PRIOR ART
PRESENT INVENTION (SOLID LINE)
SMCF OPENED
SCSS CLOSED
PRIOR ART (BROKEN LINE)
SMCF OPENED
SCSS CLOSED

FIG. 7

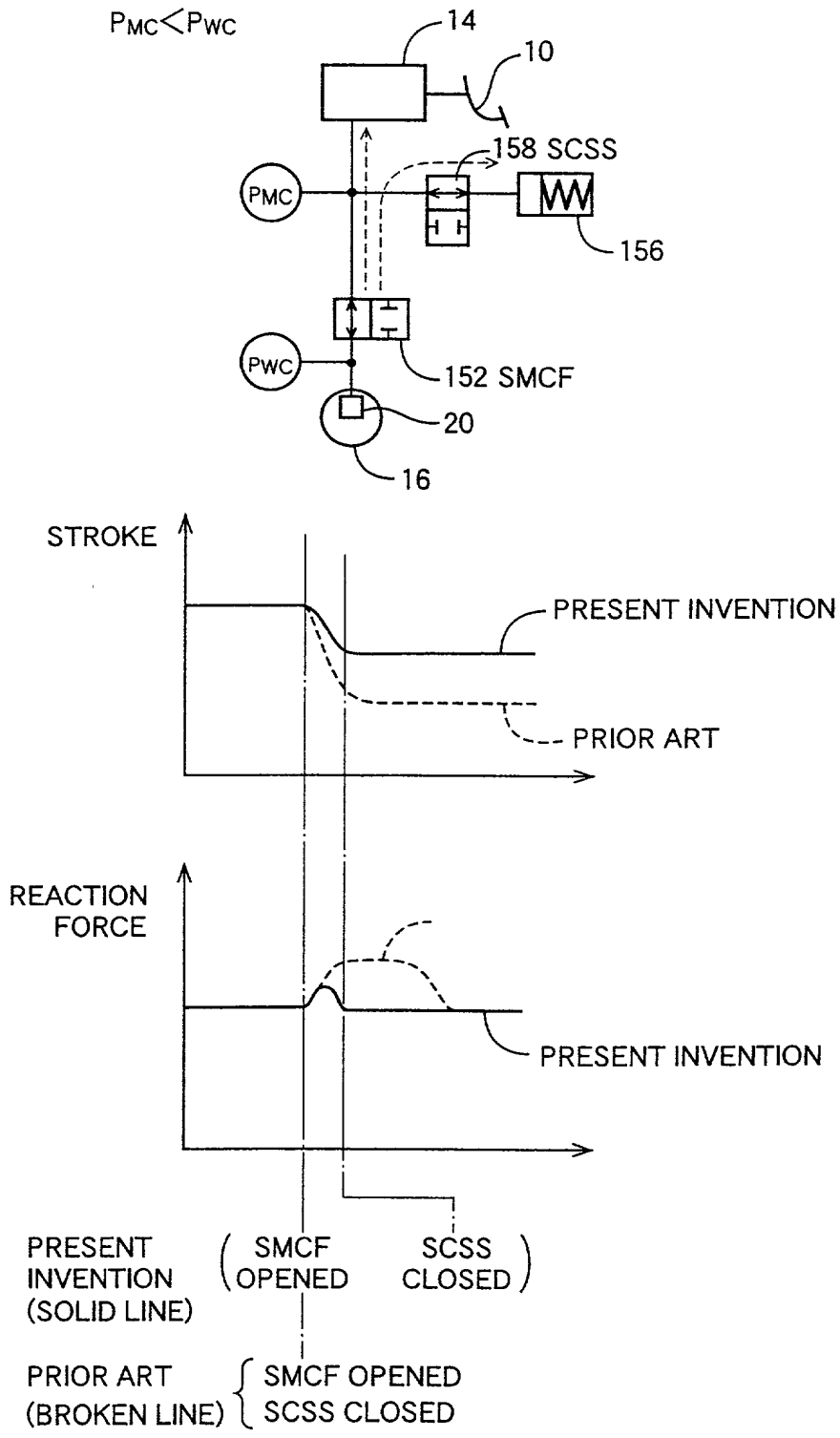

PMC<PWC
14
10
158 SCSS
PMC
156
PWC
152 SMCF
20
16
STROKE
PRESENT INVENTION
PRIOR ART
REACTION FORCE
PRESENT INVENTION
PRESENT INVENTION (SOLID LINE)
SMCF OPENED
SCSS CLOSED
PRIOR ART (BROKEN LINE)
SMCF OPENED
SCSS CLOSED

FIG. 8

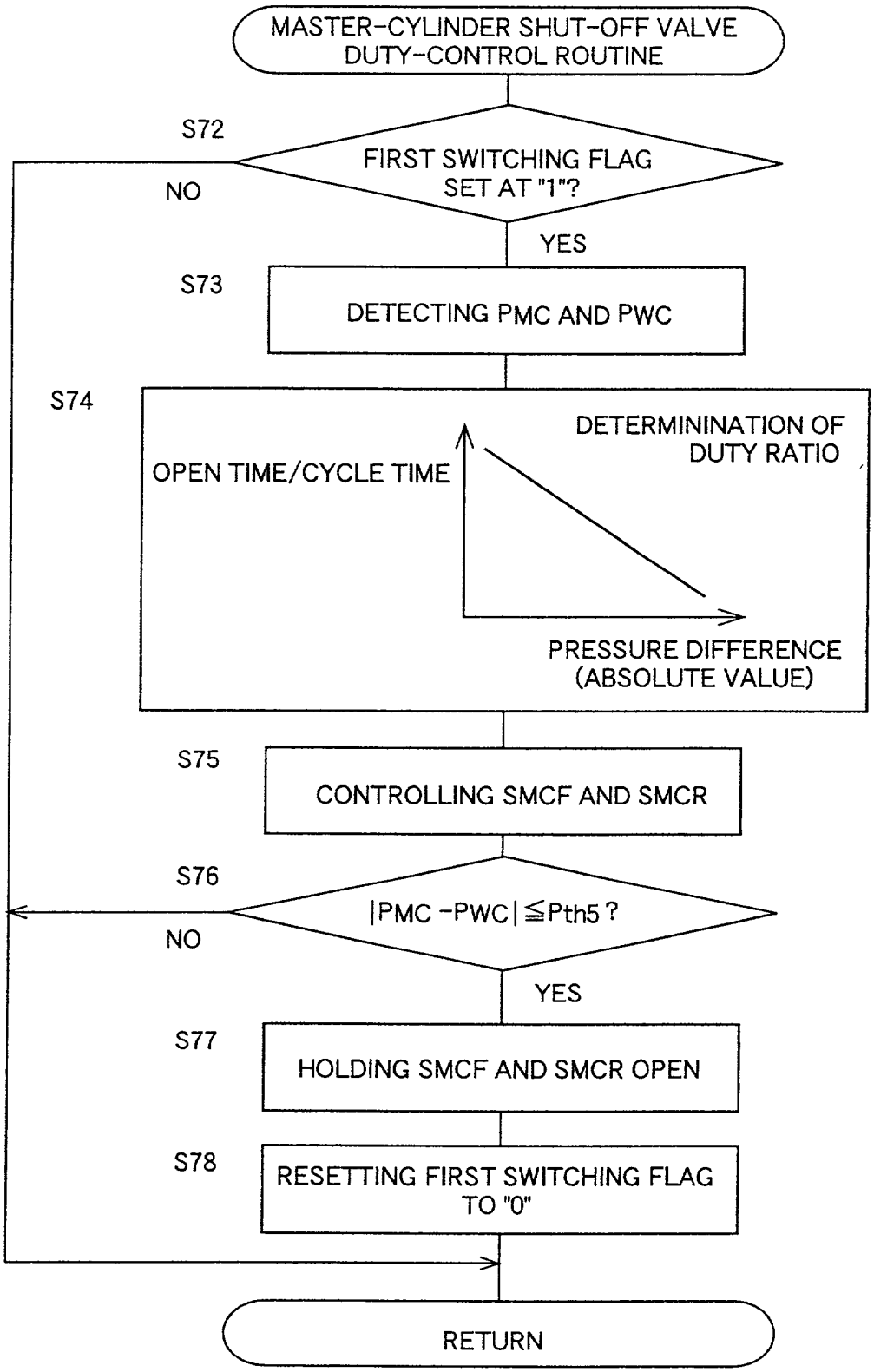

MASTER-CYLINDER SHUT-OFF VALVE DUTY-CONTROL ROUTINE
S72
FIRST SWITCHING FLAG SET AT "1"?
NO
YES
S73
DETECTING PMC AND PWC
S74
DETERMININATION OF DUTY RATIO
OPEN TIME/CYCLE TIME
PRESSURE DIFFERENCE (ABSOLUTE VALUE)
S75
CONTROLLING SMCF AND SMCR
S76
|PMC -PWC| ≦ Pth5 ?
NO
YES
S77
HOLDING SMCF AND SMCR OPEN
S78
RESETTING FIRST SWITCHING FLAG TO "0"
RETURN

FIG. 9

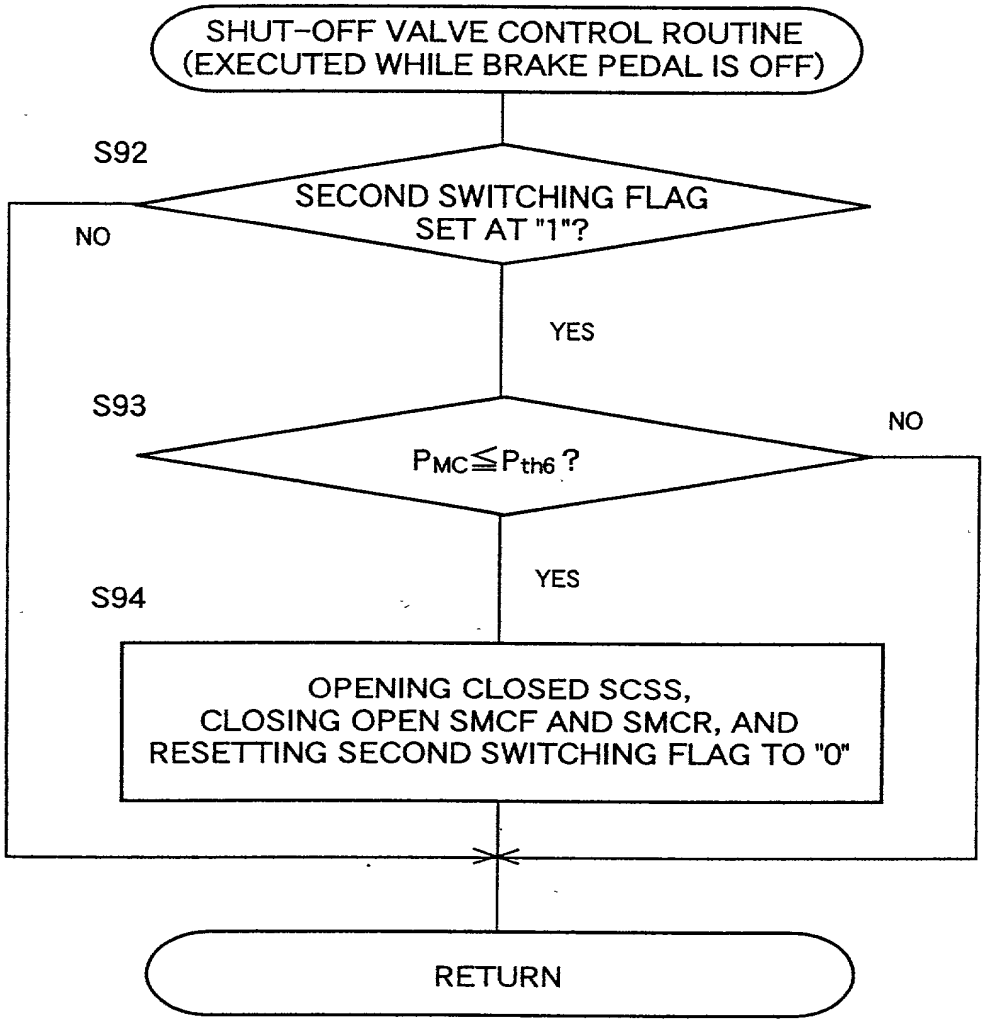

SHUT-OFF VALVE CONTROL ROUTINE
(EXECUTED WHILE BRAKE PEDAL IS OFF)
S92
SECOND SWITCHING FLAG
SET AT "1"?
NO
YES
S93
$P_{MC} \leqq P_{th6}$?
NO
YES
S94
OPENING CLOSED SCSS,
CLOSING OPEN SMCF AND SMCR, AND
RESETTING SECOND SWITCHING FLAG TO "0"
RETURN

FIG. 10

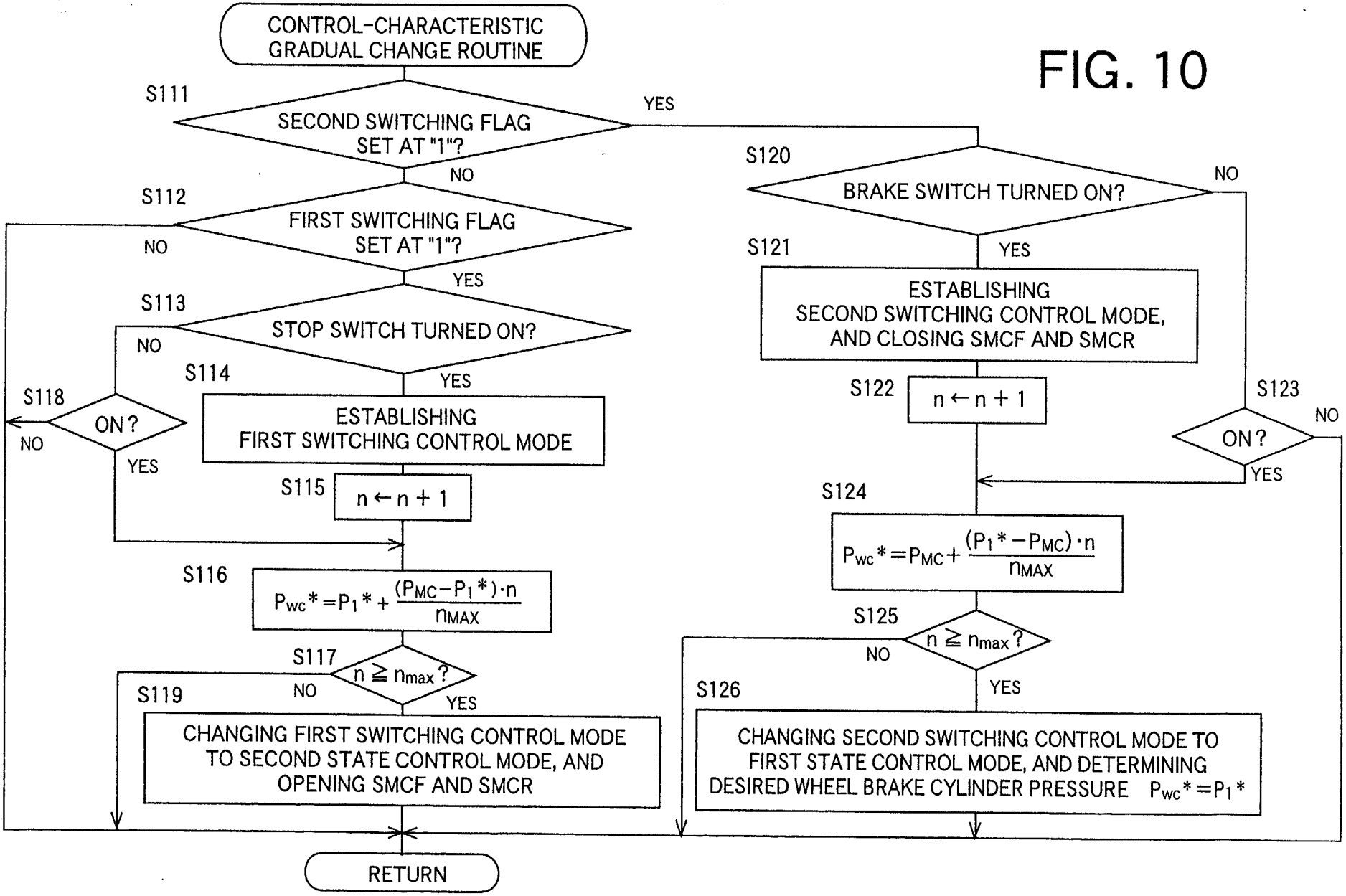


FIG. 11

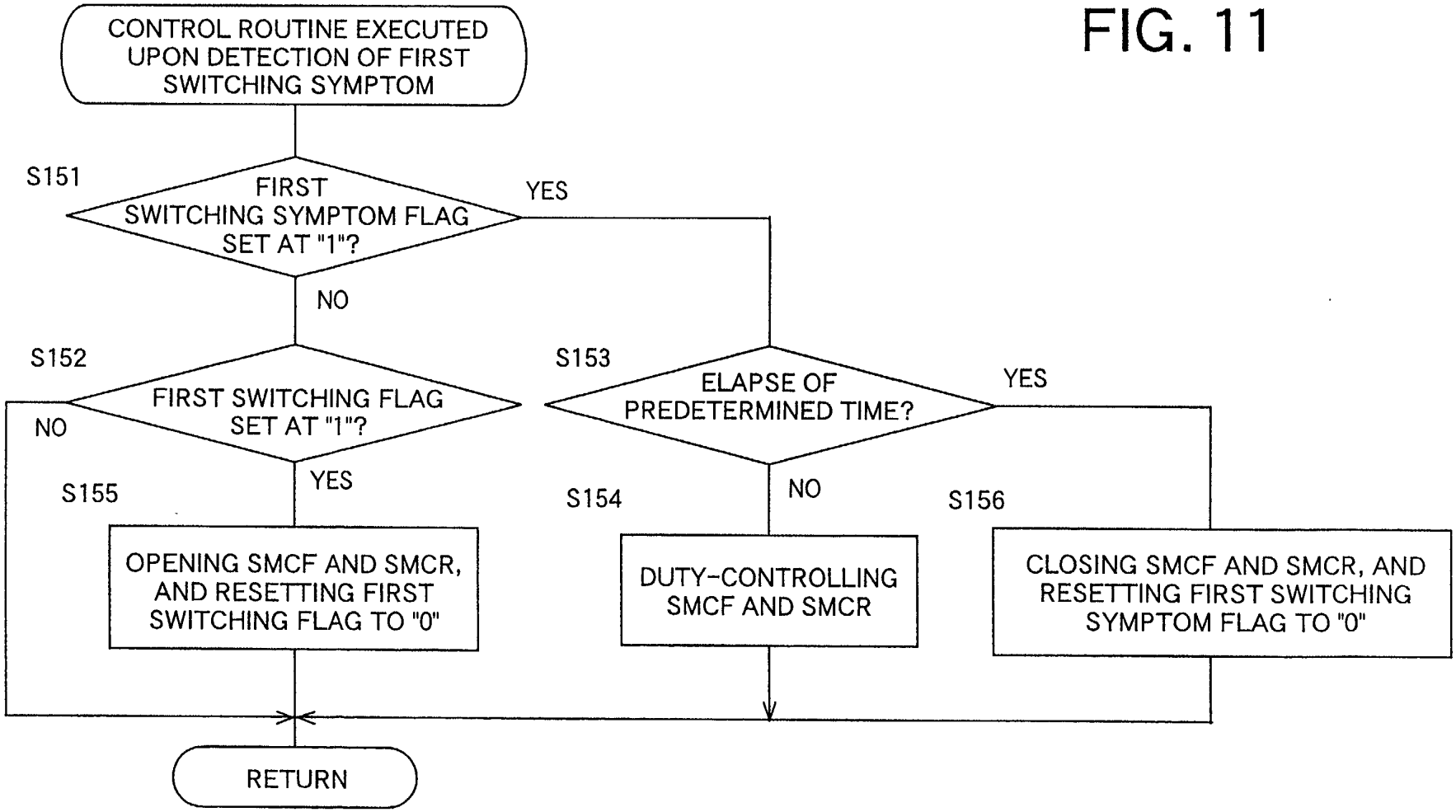
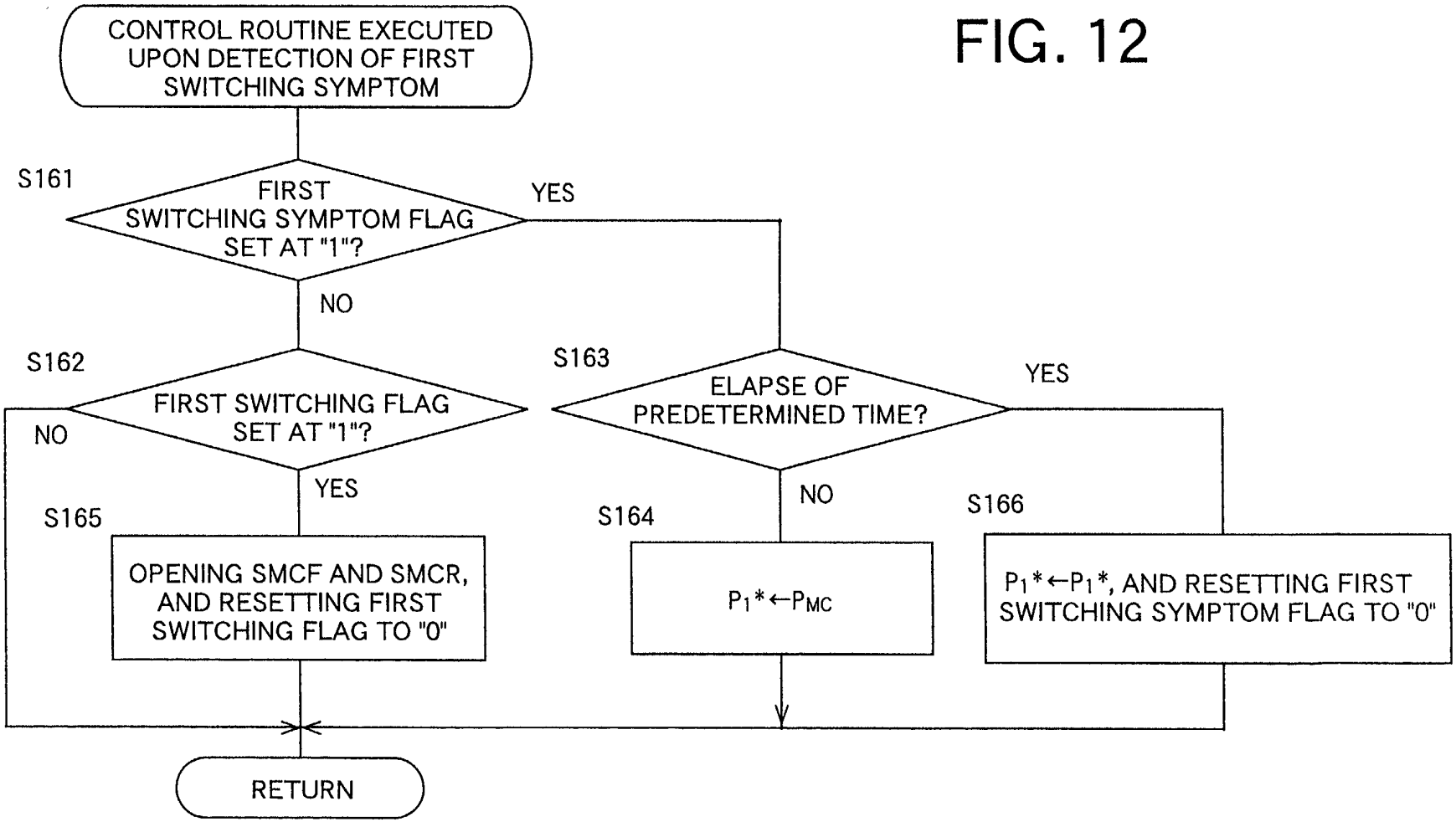

CONTROL ROUTINE EXECUTED UPON DETECTION OF FIRST SWITCHING SYMPTOM
S151
FIRST SWITCHING SYMPTOM FLAG SET AT "1"?
YES
NO
S152
FIRST SWITCHING FLAG SET AT "1"?
NO
YES
S153
ELAPSE OF PREDETERMINED TIME?
YES
NO
S155
OPENING SMCF AND SMCR, AND RESETTING FIRST SWITCHING FLAG TO "0"
S154
DUTY-CONTROLLING SMCF AND SMCR
S156
CLOSING SMCF AND SMCR, AND RESETTING FIRST SWITCHING SYMPTOM FLAG TO "0"
RETURN

FIG. 12



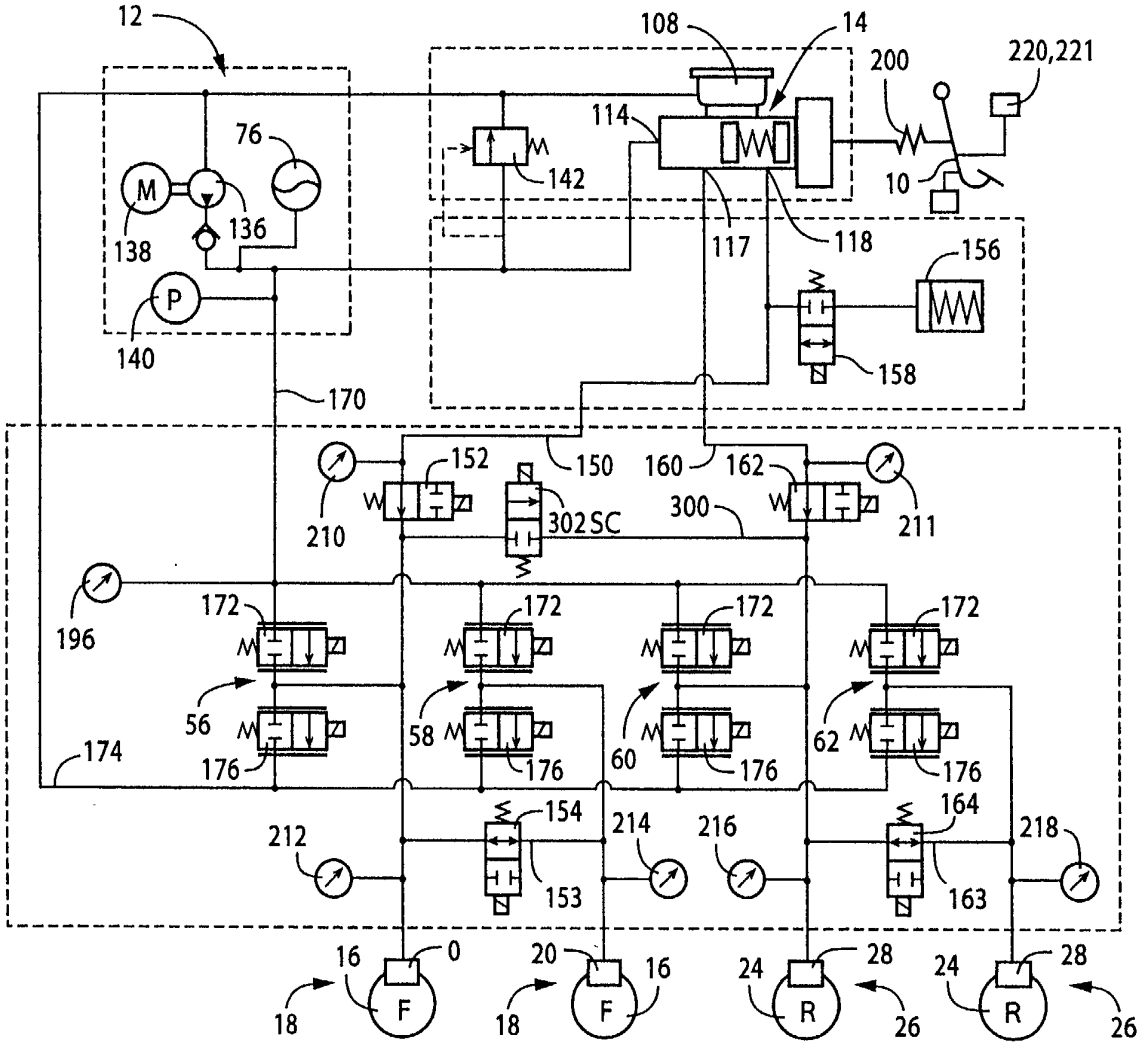
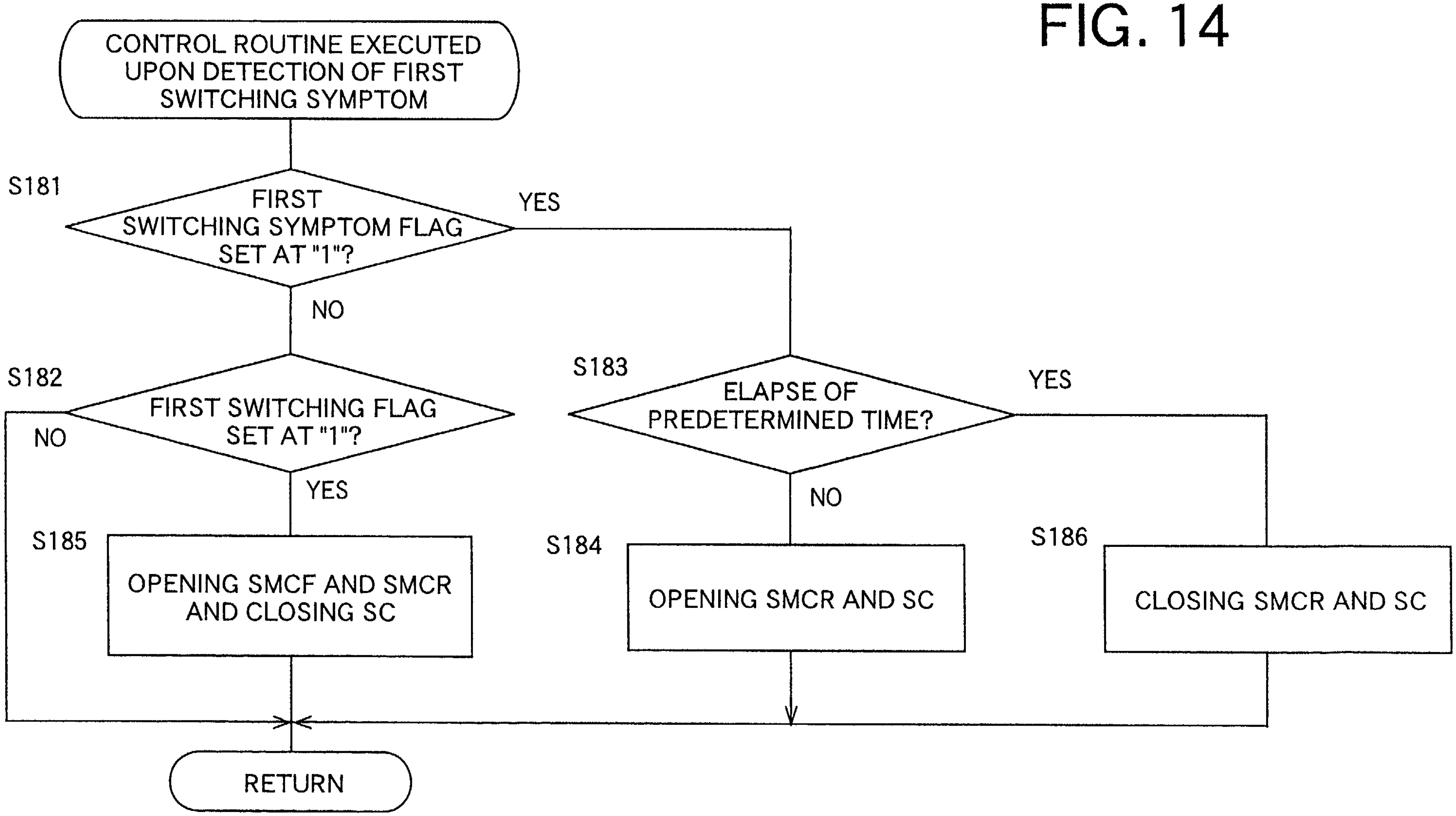


FIG. 13

FIG. 14


CONTROL ROUTINE EXECUTED UPON DETECTION OF FIRST SWITCHING SYMPTOM
S181
FIRST SWITCHING SYMPTOM FLAG SET AT "1"?
YES
NO
S182
FIRST SWITCHING FLAG SET AT "1"?
NO
YES
S183
ELAPSE OF PREDETERMINED TIME?
YES
NO
S185
OPENING SMCF AND SMCR AND CLOSING SC
S184
OPENING SMCR AND SC
S186
CLOSING SMCR AND SC
RETURN

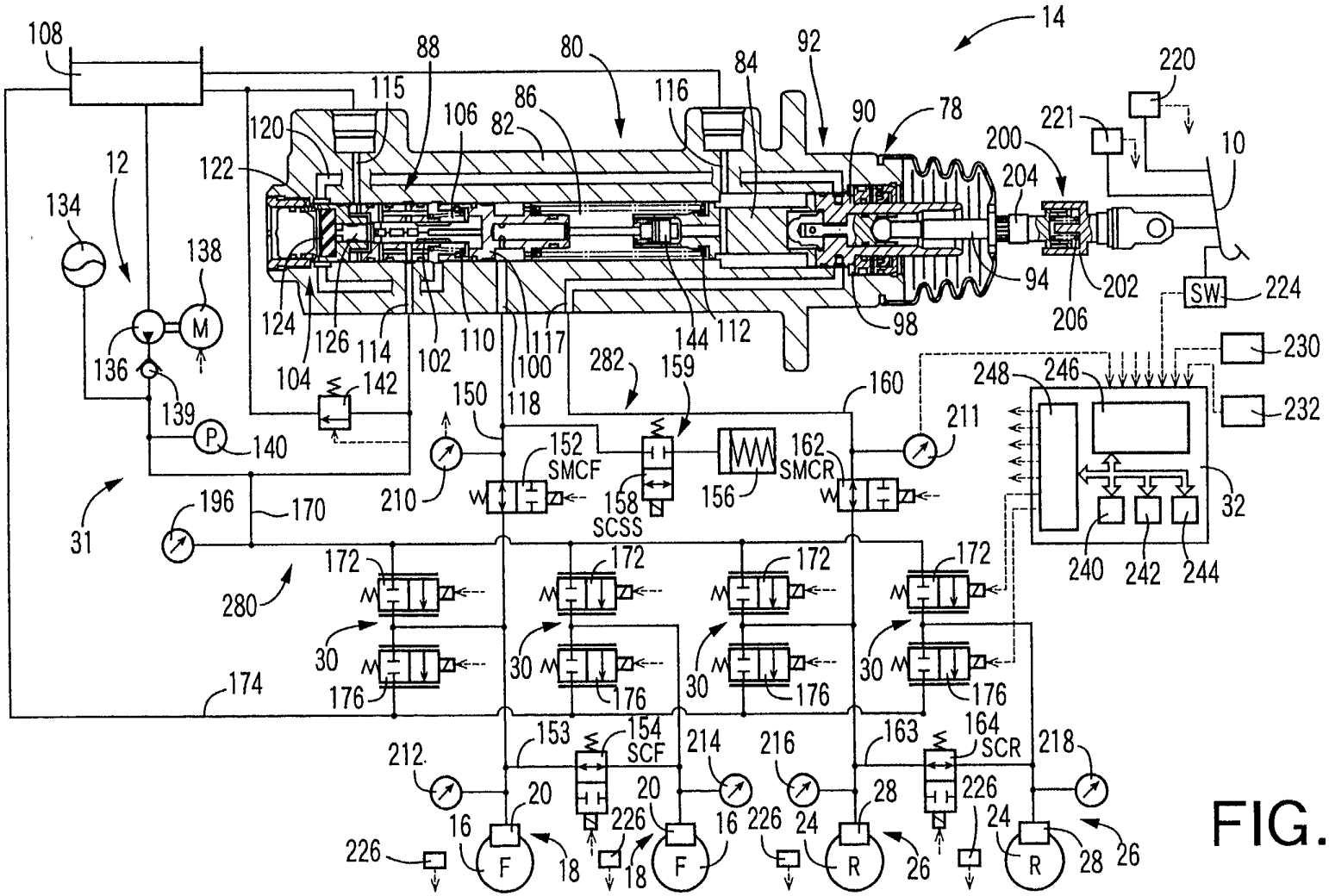


FIG. 15

FIG. 16

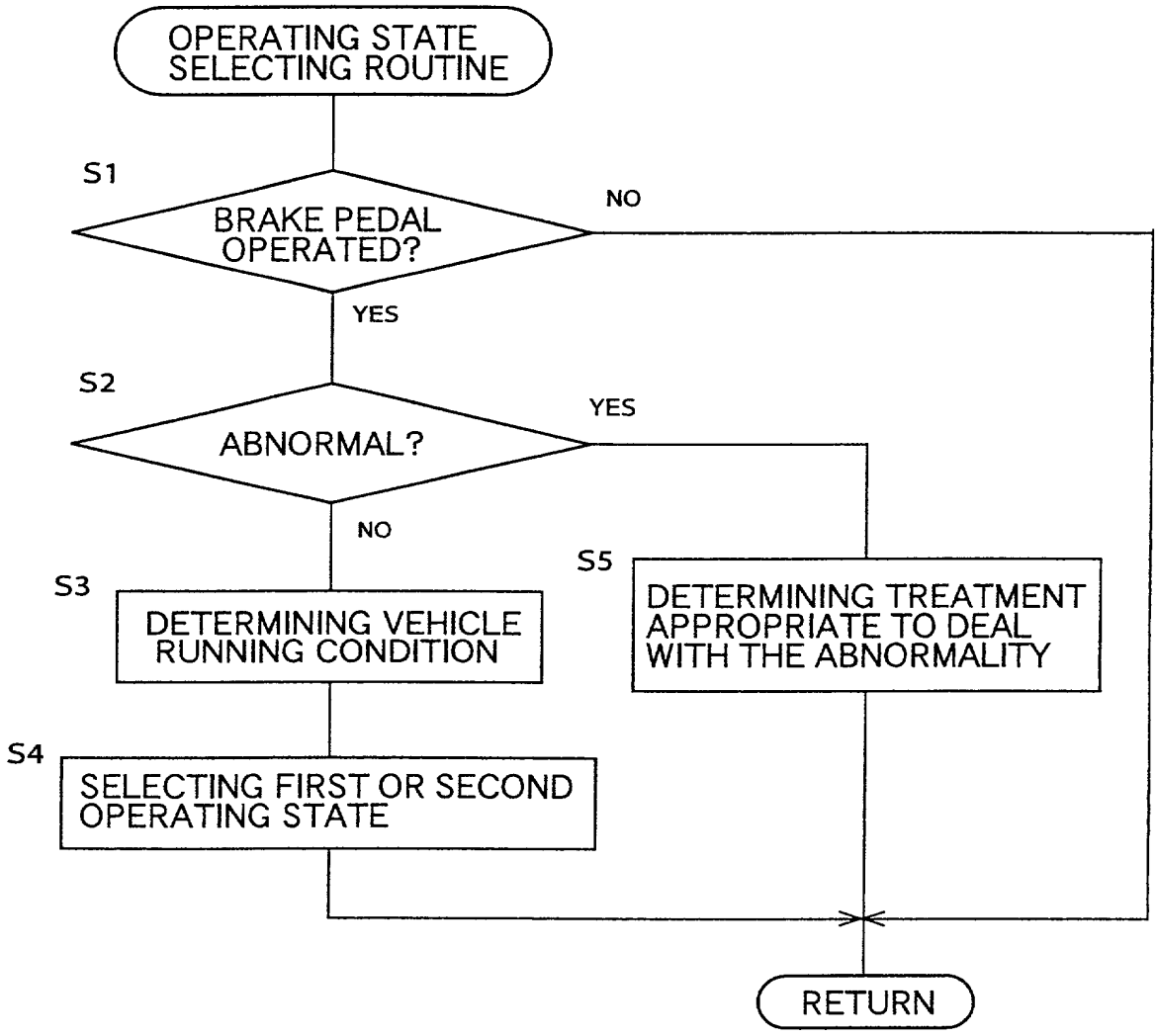

OPERATING STATE SELECTING ROUTINE
S1
BRAKE PEDAL OPERATED?
NO
YES
S2
ABNORMAL?
YES
NO
S3
DETERMINING VEHICLE RUNNING CONDITION
S4
SELECTING FIRST OR SECOND OPERATING STATE
S5
DETERMINING TREATMENT APPROPRIATE TO DEAL WITH THE ABNORMALITY
RETURN

FIG. 17

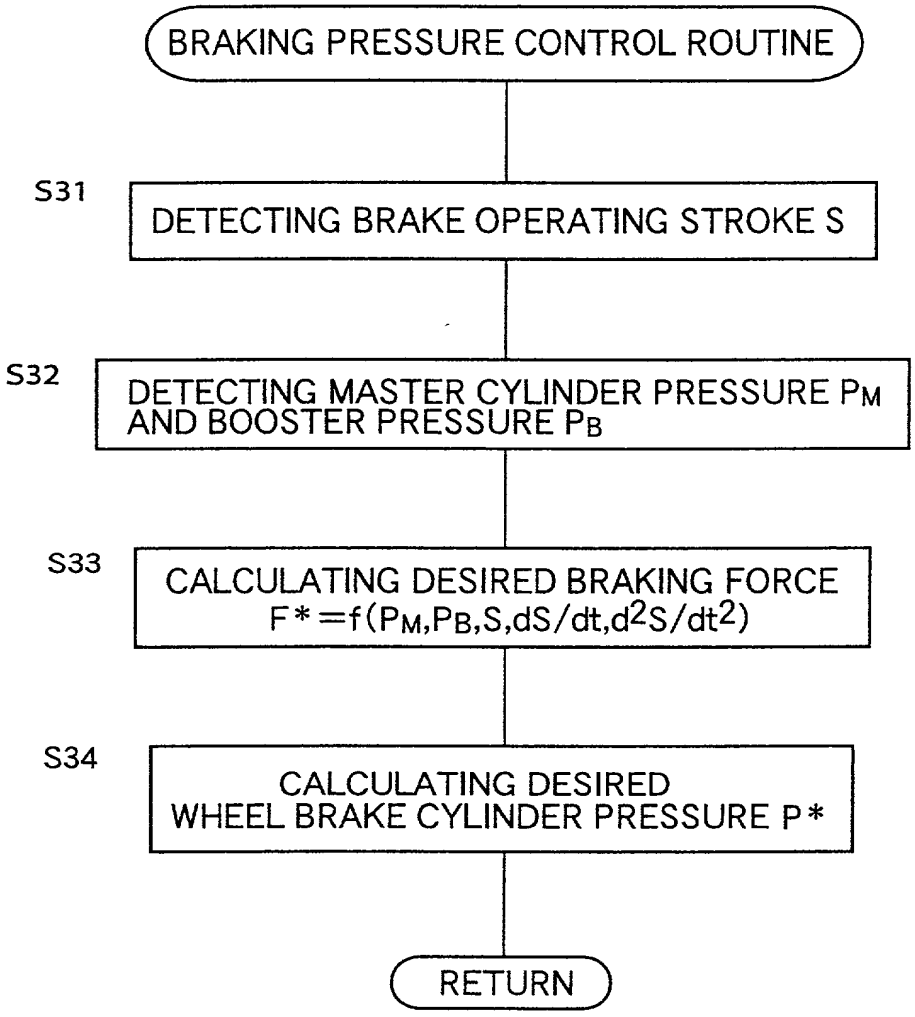

BRAKING PRESSURE CONTROL ROUTINE
S31
DETECTING BRAKE OPERATING STROKE S
S32
DETECTING MASTER CYLINDER PRESSURE PM AND BOOSTER PRESSURE PB
S33
CALCULATING DESIRED BRAKING FORCE F*=f(PM,PB,S,dS/dt,d2S/dt2)
S34
CALCULATING DESIRED WHEEL BRAKE CYLINDER PRESSURE P*
RETURN

FIG. 18

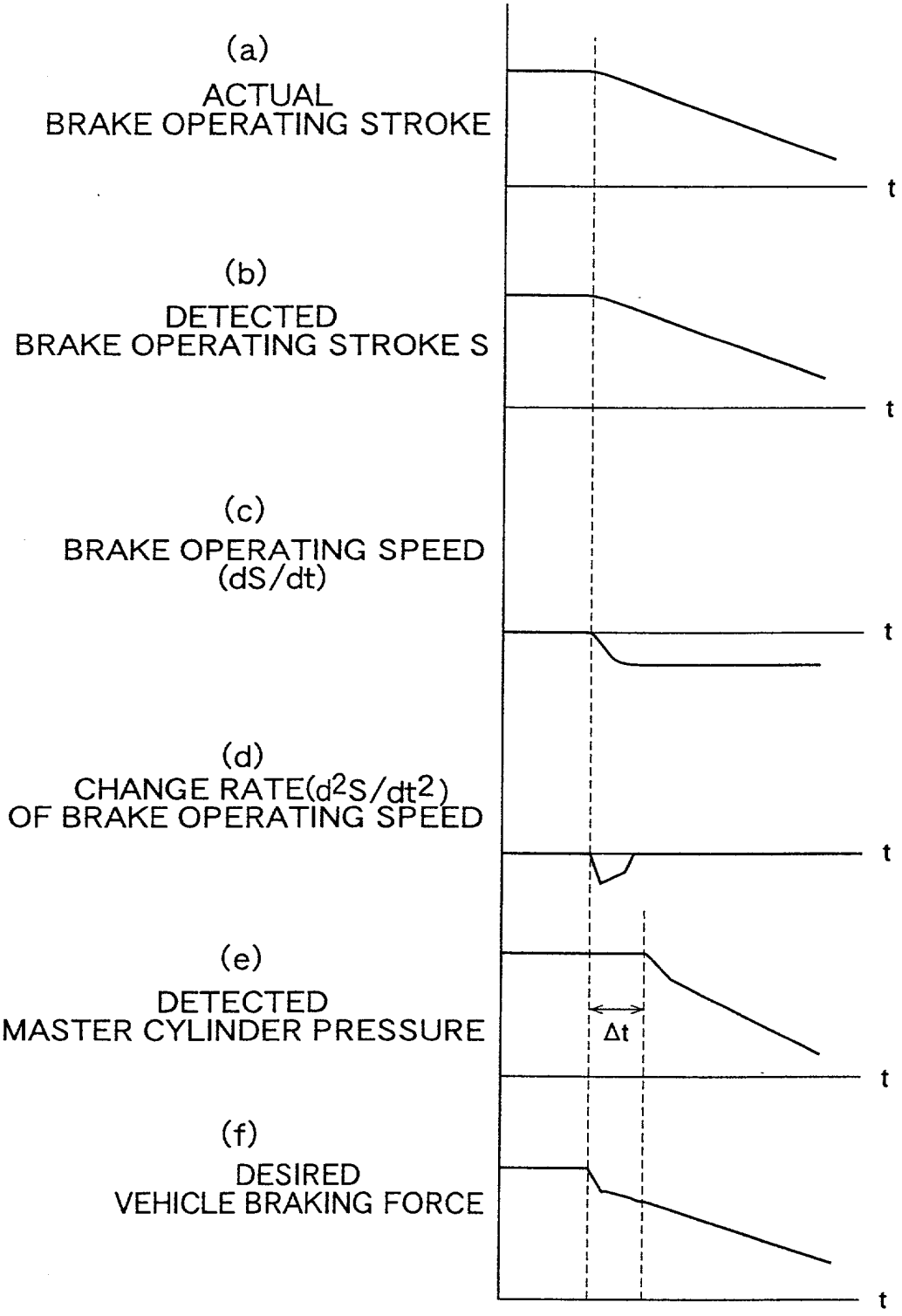

(a)
ACTUAL
BRAKE OPERATING STROKE
t
(b)
DETECTED
BRAKE OPERATING STROKE S
t
(c)
BRAKE OPERATING SPEED
(dS/dt)
t
(d)
CHANGE RATE(d^2S/dt^2)
OF BRAKE OPERATING SPEED
t
(e)
DETECTED
MASTER CYLINDER PRESSURE
Δt
t
(f)
DESIRED
VEHICLE BRAKING FORCE
t

FIG. 19A

ABNORMAL DEVICES OR ELEMENTS		ABNORMAL STATE (TREATMENTS)	FIRST STATE	
			KEPT	INHIBITED
PUMP DEVICE (FIRST HYD. PRESSURE SOURCE)	PUMP MOTOR	LOW ACCUMULATOR PRESSURE		O
	PUMP	LOW ACCUMULATOR PRESSURE		O
	ACCUMULATOR	LOW ACCUMULATOR PRESSURE		O
SECOND HYD. SYSTEM	SHUT-OFF VALVE	STUCK IN CLOSED POSITION		O
	STROKE SIMLATOR	SHUT-OFF VALVE STUCK IN CLOSED POSITION		O
	HYDRAULIC BOOSTER	LOW MASTER CYLINDER PRESSURE OR LOW BOOSTER PRESSURE	O	
LINEAR VALVE DEVICES	INCREASING VALVE	STUCK IN OPEN POSIITON (PRESSURE DROP AFTER RAPID RISE → LOW ACCUMULATOR PRESSURE)		O
		STUCK IN CLOSED POSITION (OPENING COMMUNICATING VALVE)		O

FIG. 19B

ABNORMAL DEVICES OR ELEMENTS		ABNORMAL STATE (TREATMENTS)	FIRST STATE	
			KEPT	INHIBITED
		(CONTROLLING 4 BRAKE CYLINDERS)		
	REDUCING VALVE	STUCK IN OPEN POSITION (CONTROLLING 3 BRAKE CYLINDERS)	O	
		STUCK IN CLOSED POSITION (OPENING COMMUNICATING VALVE) (CONTROLLING 4 BRAKE CYLINDERS)	O	
	FRONT OR REAR LINEAR VALVE	ABNORMAL VALVE IN SECOND STATE AND NORMAL VALVE IN FIRST STATE	O	
SENSORS	CYLINDER PRESSURE SENSOR	OPENING COMMUNICATING VALVE (CONTROLLING 4 BRAKE CYLINDERS)	O	
	ONE OF TWO ACC PRESSURE SENSORS	INACCURATE DETECTION OF ACC PRESSURE, ALTHOUGH THE DETECTION IS POSSIBLE BY THE OTHER NORMAL SENSOR		O

FIG. 19C

ABNORMAL DEVICES OR ELEMENTS		ABNORMAL STATE	FIRST STATE	
			KEPT	INHIBITED
	ONE OF TWO MC PRESSURE SENSORS	CONTROL BASED ON THE OTHER NORMAL SENSOR, OR THE STROKE SENSORS	O	

FIG. 20

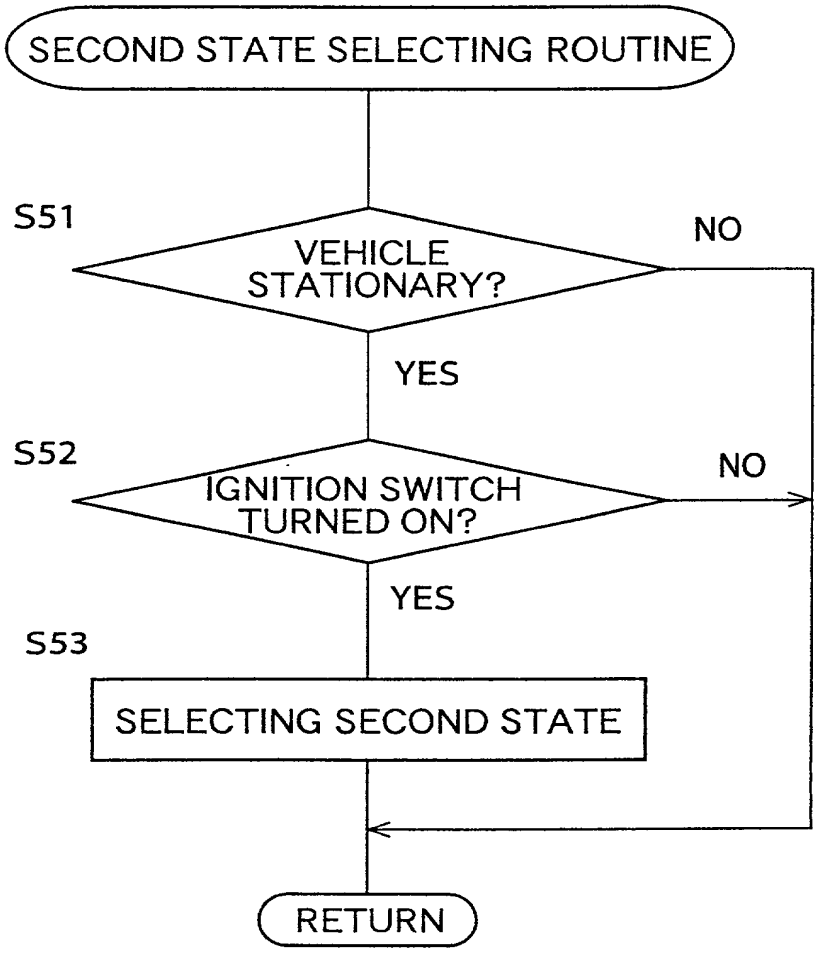

SECOND STATE SELECTING ROUTINE
S51
VEHICLE STATIONARY?
NO
YES
S52
IGNITION SWITCH TURNED ON?
NO
YES
S53
SELECTING SECOND STATE
RETURN

FIG. 21

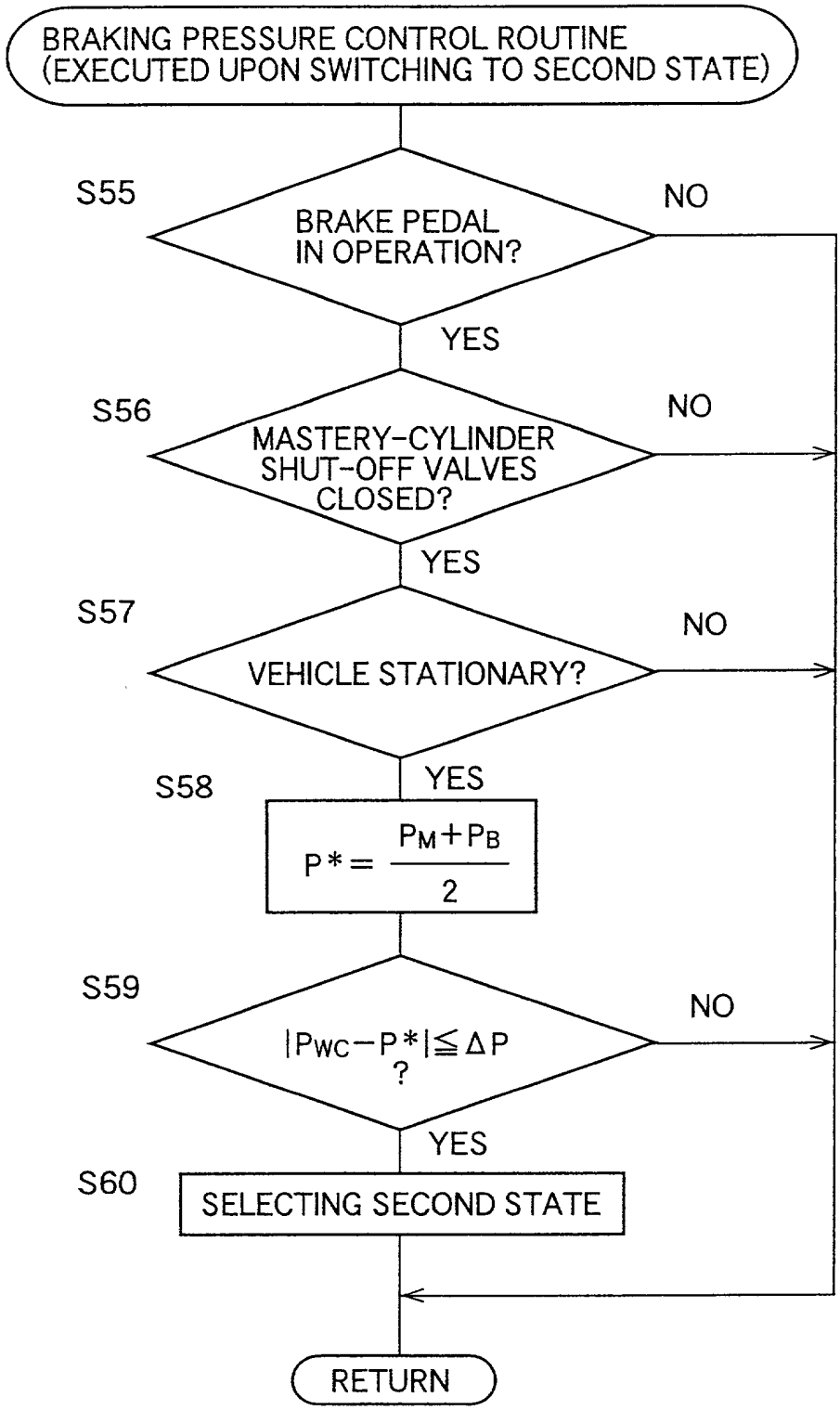

BRAKING PRESSURE CONTROL ROUTINE
(EXECUTED UPON SWITCHING TO SECOND STATE)
S55
BRAKE PEDAL IN OPERATION?
NO
YES
S56
MASTERY-CYLINDER SHUT-OFF VALVES CLOSED?
NO
YES
S57
VEHICLE STATIONARY?
NO
YES
S58
$P^* = \frac{P_M + P_B}{2}$
S59
$|P_{WC} - P^*| \leqq \Delta P$?
NO
YES
S60
SELECTING SECOND STATE
RETURN

FIG. 22

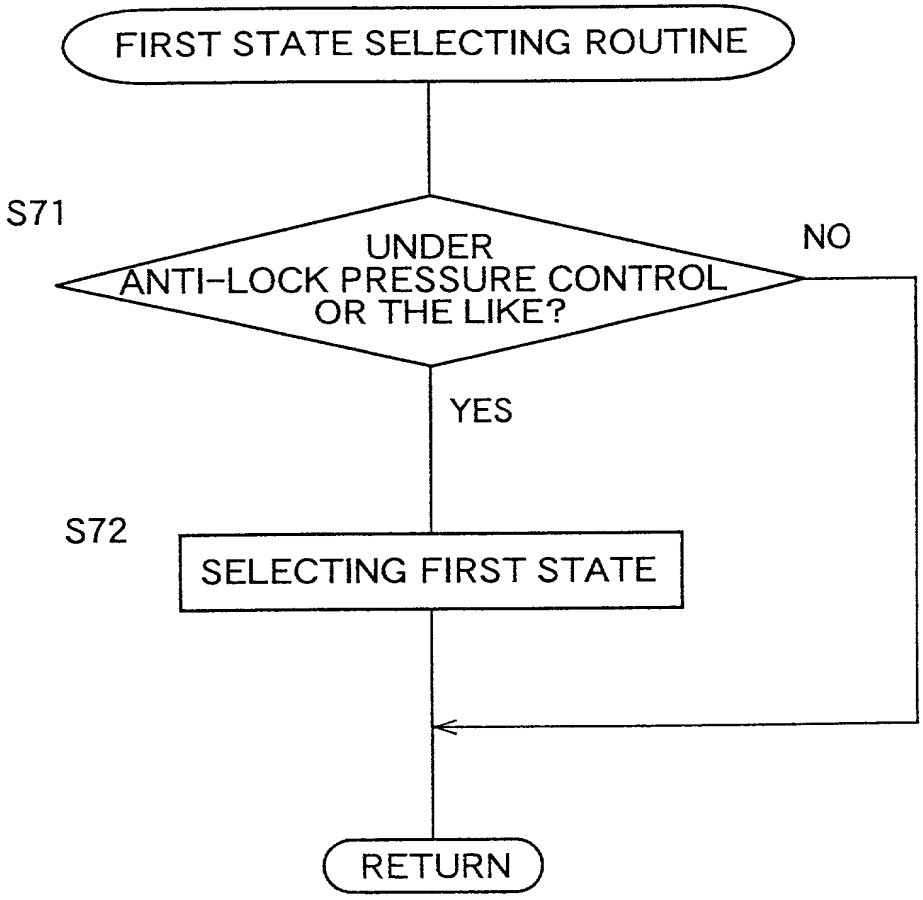

FIRST STATE SELECTING ROUTINE
S71
UNDER ANTI-LOCK PRESSURE CONTROL OR THE LIKE?
NO
YES
S72
SELECTING FIRST STATE
RETURN

FIG. 23

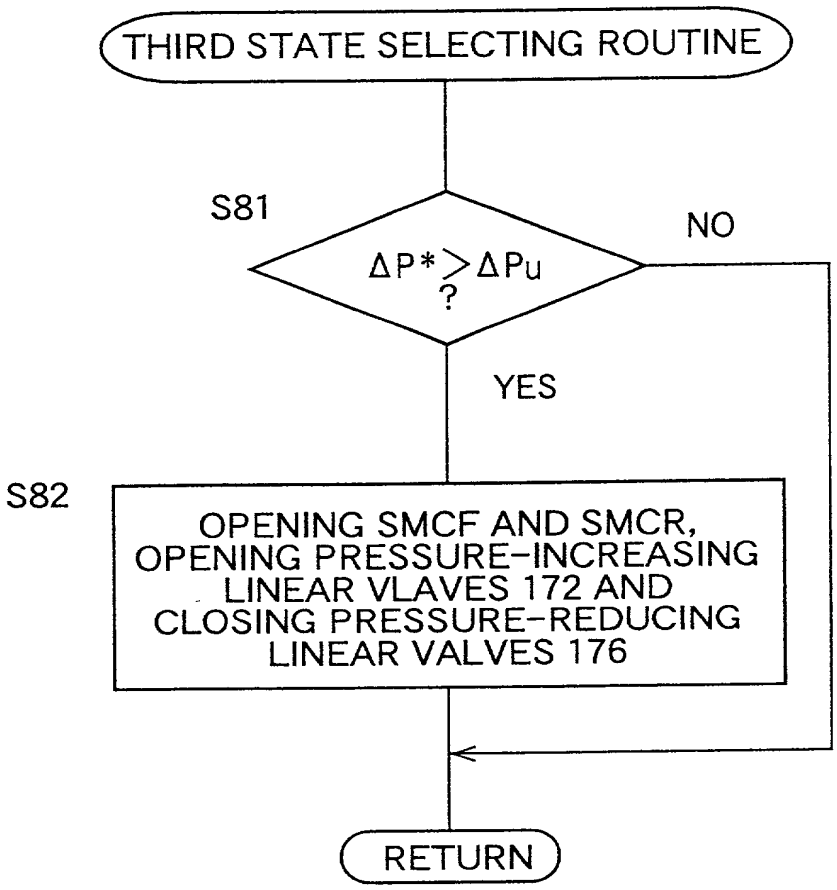
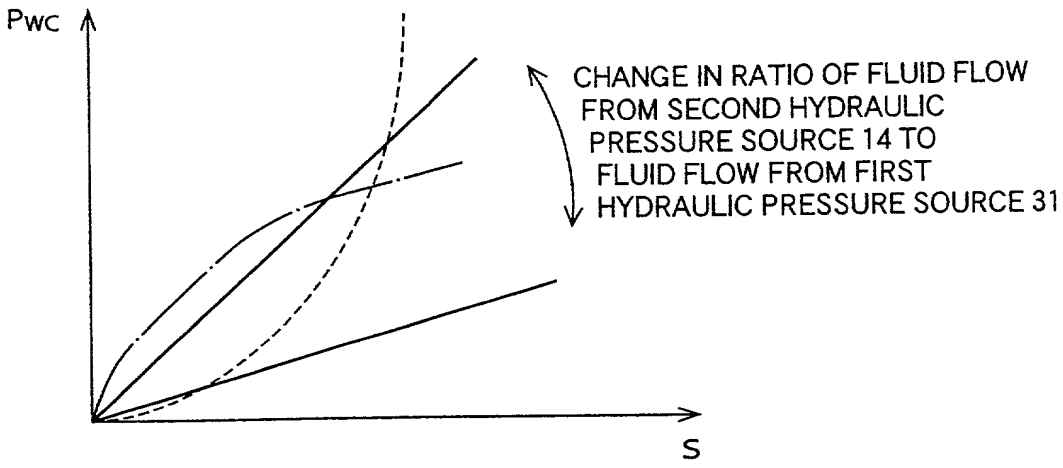

THIRD STATE SELECTING ROUTINE
S81
ΔP* > ΔPu ?
NO
YES
S82
OPENING SMCF AND SMCR, OPENING PRESSURE-INCREASING LINEAR VLAVES 172 AND CLOSING PRESSURE-REDUCING LINEAR VALVES 176
RETURN

FIG. 24


Pwc
S
CHANGE IN RATIO OF FLUID FLOW FROM SECOND HYDRAULIC PRESSURE SOURCE 14 TO FLUID FLOW FROM FIRST HYDRAULIC PRESSURE SOURCE 31

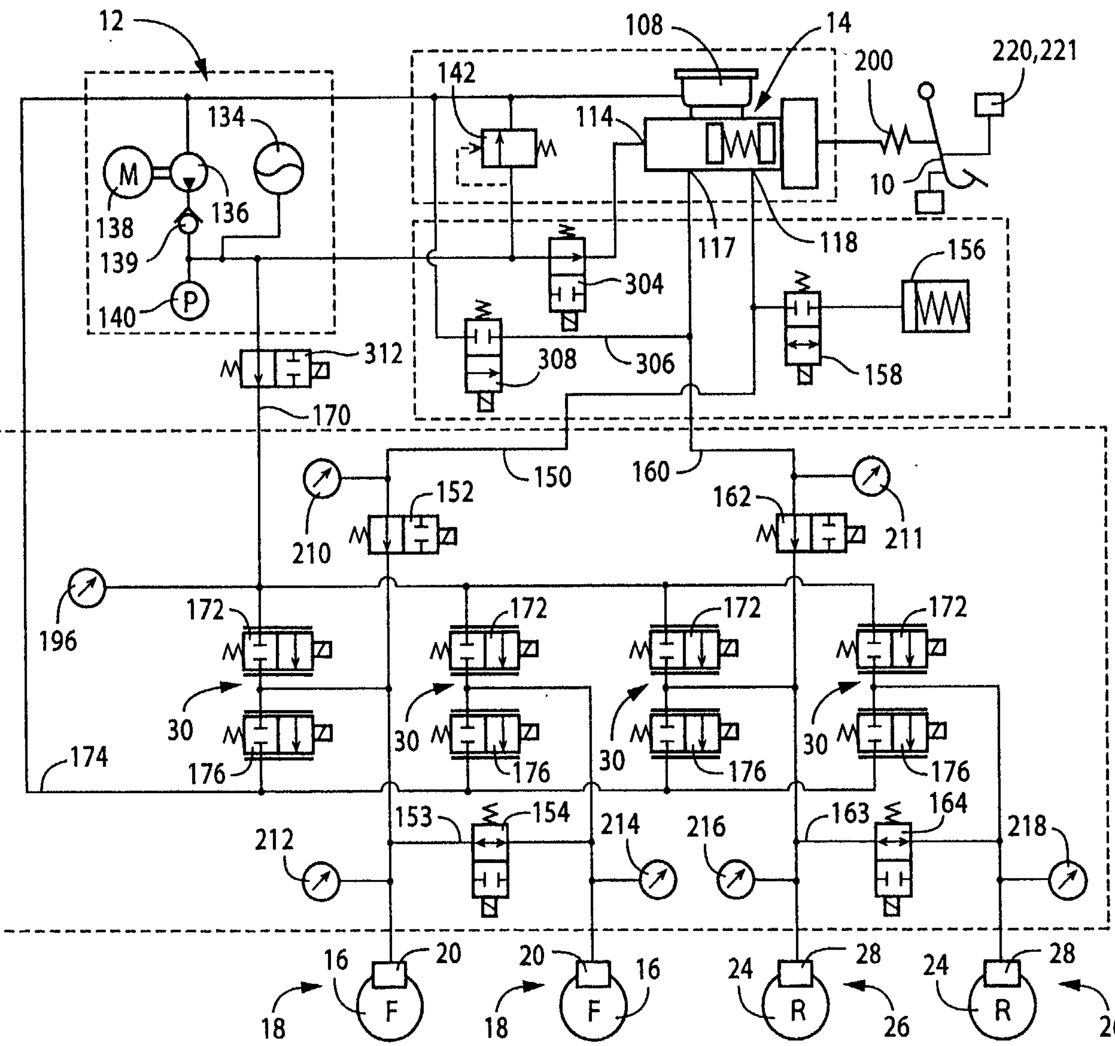

12
108
14
200
220,221
134
142
114
M
136
138
10
139
117
118
156
304
140
P
308
306
158
312
170
150
160
152
162
210
211
196
172
172
172
172
30
30
30
30
176
176
176
176
174
153
154
164
163
212
214
216
218
16
20
20
16
24
28
24
28
F
F
R
R
18
18
26
26

FIG. 25